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NP10 8QQ

I, the undersigned, being an officer duly authorised in accordance with Section 74(1) and (4) of the Deregulation and Contracting Out Act 1994, to sign and issue certificates on behalf of the Comptroller-General, hereby certify that annexed hereto is a true copy of the documents as originally filed in connection with the patent application identified therein together with the Statement of inventorship and of right to grant of a Patent (Form 7/77), which was also filed.

In accordance with the Patents (Companies Re-registration) Rules 1982, if a company named in this certificate and any accompanying documents has re-registered under the Companies Act 1980 with the same name as that with which it was registered immediately before re-registration save for the substitution as, or inclusion as, the last part of the name of the words "public limited company" or their equivalents in Welsh, references to the name of the company in this certificate and any accompanying documents shall be treated as references to the name with which it is so re-registered.

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Signed

Dated 2 March 2004

Patents Form 1/77

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Patents Act 1977
(Rule 16)

The **Patent Office**

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THE PATENT OFFICE
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31 MAR 2003
NEWPORT

Request for grant of a patent

The Patent Office

Cardiff Road
Newport
Gwent NP10 8QQ

1. Your reference	203-0055GB/SPP
2. Patent application number	0307371.5
3. Full name, address and postcode of the or of each applicant.	Ford Global Technologies, LLC Suite 600, Parklane Towers East One Parklane Boulevard, Dearborn Michigan 48126-2490 USA
Patents ADP number	8600959001
If the applicant is a corporate body, give the country/state of its incorporation	Delaware, United States of America
4. Title of the invention	**Display Unit for a Vehicle**
5. Name of your agent	S P Potts et al
"Address for service" in the United Kingdom to which all correspondence should be sent.	Land Rover Patent Department 53W5/12 Warwick Technology Park Warwick CV34 6RG
Patents ADP Number	8460602001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or each of these earlier applications and the or each application number.

Country	Priority application number	Date of filing

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application	Date of filing

8. Is a statement of inventorship and of right to grant of a patent required in support of this request. YES

Patents Form 1/77

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	
Description	4
Claim(s)	2
Abstract	1
Drawing(s)	1

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent *(Patents Form 7/77)*	2
Request for preliminary examination and search *(Patents Form 9/77)*	1
Request for substantive examination *(Patents Form 10/77)*	
Any other documents *(please specify)*	

11. I/We request the grant of a patent on the basis of this application.

Signature — Date: 24 March 2003

S P Potts — Agent

12. Name and daytime telephone number of person to contact in the United Kingdom.

S P Potts — 01926 482150

Patents Form 7/77

Patents Act 1977
(Rule 15)

The Patent Office

7/77

Statement of inventorship and of right to grant of a patent

The Patent Office

Cardiff Road
Newport
Gwent NP10 8QQ

1. Your reference	203-0055GB/SPP
2. Patent application number	0307371.5
3. Full name of the or of each applicant.	Ford Global Technologies, LLC
4. Title of the invention	**Display Unit for a Vehicle**
5. State how the applicant(s) derived the right from the inventor(s) to be granted a patent	By virtue of agreements giving rights to inventions made by the employer of the inventor(s)
6. How many, if any, additional Patents Forms 7/77 are attached to this form?	
7.	I/we believe that the person(s) named over the page *(and on any extra copies of this form)* is/are the inventor(s) of the invention which the above patent application relates to. Signature: S P Potts (Agent) Date: 24 March 2003
8. Name and daytime telephone number of person to contact in the United Kingdom.	S P Potts 01926 482150

Patents Form 7/77

Patents Form 7/77

Enter the full names, addresses and postcodes of the inventors in the boxes and underline the surnames

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Display Unit for a Vehicle

The present invention relates to display units for vehicles and particularly to display units for providing visual information to the driver of a motor vehicle.

GB-A-2246900 discloses a dashboard-mounted vehicle display unit comprising a liquid crystal display abutting one face of a prism wherein a real image produced by the liquid crystal display is reflected from a second face of the prism (which is positioned up against the vehicle's windscreen) and through its third face towards the driver's eye. The driver views the virtual image as if it were located on the windscreen. The problem with this arrangement is that in order to view this display, the driver must adjust the focal point of his eyes when he changes from looking at the road ahead to glancing at the display in front of him. This can result in accommodation eye strain and is particularly a problem for older drivers and for young drivers when travelling at night. The distance of the virtual image from the driver's eyes can be, in theory, increased by increasing the focussing power of the prism. However in order to obtain a comfortable distance (of at least 2 metres), such an increase in focussing power incurs the disadvantages of excessive optical aberrations and manufacturing difficulties.

The present invention comprises a display unit for a vehicle, the display unit including; image display means for providing an image, and an optical system for permitting viewing of the image by a driver of the vehicle at a comfortable distance, wherein the optical system includes a reflecting surface and an optical prism having focusing power, the reflecting surface being interposed between the image display means and a first transmitting face of the optical prism and inclined with respect thereto to reflect the image onto said first face, whereupon the image is reflected from a second reflecting face of the optical prism towards and through a third transmitting face of the optical prism for viewing by the driver.

Hence the invention is configured to generate an initial real image whose content the driver will eventually observe, to form a virtual image of a desired size and position, and to provide a viewpoint through which the virtual image can be observed.

The provision of the reflecting surface permits an increase in the path length from the real image to the prism (which acts as a convex lens) without taking up a large amount of space in the dashboard (which might be required for other purposes), and thereby enabling the virtual image as viewed by the driver, to appear to be at a comfortable distance, without requiring a large curvature to be incorporated in the prism faces.

The image display means may, for example, be a liquid crystal display panel and light source. Alternatively, the image display means may comprise a plasma panel, ferromagnetic display or any other display device that will produce a suitable image.

The image may comprise vehicle information such as speed, engine temperature, etc in the form of alpha numeric data and graphical symbology. Alternatively or additionally, the image may comprise a view of the road ahead derived from signals from a forward-looking vehicle-mounted camera or infra red sensor.

The reflecting surface may comprise a silvered mirror and the prism may be made from glass or acrylic material or any other suitable optical material.

In one arrangement, the refractive index of the prism is chosen so that total internal reflection of the light rays comprising the image reflected through the first face occurs at the second face. Alternatively or additionally, the second face may be provided with a reflective coating.

In one embodiment, the distance from the display to the first face of the prism is set and the focussing of power the prism is adjusted, (by setting the curvature of each of its three faces), so that the image viewed by the driver appears to be at a distance of

approximately 2 metres (from the driver's eye) close to the end of the front of a typical passenger saloon. This has the advantage of ease of eye accommodation for the driver.

In a preferred embodiment, the image display means and reflecting surface are mounted within the dashboard of the vehicle, and the prism sits on top of it when in use. The prism may be moveable from a stored position within the dashboard to a deployed position on top of the dashboard by pivoting and / or sliding means. Some small adjustment may also be provided so that an optimum viewing angle can be provided to the driver.

Alternatively, the display unit may be incorporated in the instrument cluster.

An embodiment will now be described, by way of example only, with reference to the drawing, which is a schematic diagram of a display unit incorporated in a vehicle.

In the drawing, a display unit consists of a back-lit liquid crystal display panel 1 and a light-path-folding plane, silvered mirror 2 both mounted in a dashboard 3 of a vehicle, and a prism 4 mounted on the dashboard 3 and above a steering wheel 5. The position of a driver's eye is denoted by reference numeral 6 and a line of vision 7 extends from point 6 through the prism 4 and through and beyond the vehicle's windscreen 8.

In this example, the liquid crystal display panel 1 displays an image comprising a scene of the road ahead supplied by a vehicle-mounted forward-looking sensor (not shown). An optical ray can be traced from the display panel 1 to the mirror 2 where it is reflected towards the prism 4. The ray passes through a first prism face 4a (which is convex) and is totally-internally reflected off a second face 4b which is plane. The ray then emerges through a third prism face 4c which is convex, towards the driver's eye at point 6. The driver, looking through the third face 4c of the prism, sees a magnified virtual image 9 at a distance of 2 metres or so. The geometrical relationships of the prism, mirror and display shown in the drawing, permit ease of packaging within the dashboard.

The display unit of the drawing provides a rigid and stable optical arrangement with just three close-coupled, mechanically simple components.

Advantageously, the image is displayed to the driver in an ergonomically desirable way. It permits the image to appear within the driver's usual line of sight with sufficient brightness and resolution and at a distance which does not place excessive demands on the driver's eye accommodation and other capabilities.

CLAIMS

1. A display unit for a vehicle, the display unit including; image display means for producing an image. and an optical system for permitting viewing of the image by a driver of the vehicle at a comfortable distance, wherein the optical system includes a reflecting surface and an optical prism having focusing power, the reflecting surface being interposed between the image display means and a first transmitting face of the optical prism and inclined with respect thereto to reflect the image onto said first face, whereupon the image is reflected from a second reflecting face of the optical prism towards and through a third transmitting face of the optical prism for viewing by the driver.

2. A display unit according to claim 1 in which the image display comprises a liquid crystal display panel and a light source.

3. A display unit according to either preceding claim in which the reflecting surface is a silvered mirror.

4. A display unit according to any preceding claim in which the optical prism is made from glass.

5. A display unit according to any of claims 1-3 in which the optical prism is made from acrylic material.

6. A display unit according to any preceding claim in which the second face of the optical prism is provided with a reflective coating.

7. A display unit according to any preceding claim in which the first and third faces of the optical prism are convex and the second face is plane.

8. A display unit according to any preceding claim in which the distance from the image display to the first face of the optical prism and the focussing power of the optical prism is adjusted, by setting the curvature of each of its three faces, so that the image viewed by the driver appears to be at a distance approximately 2 metres from the driver's eye.

9. A display unit according to any preceding claim in which the optical prism is adapted to be moveable between a stored position and a deployed position.

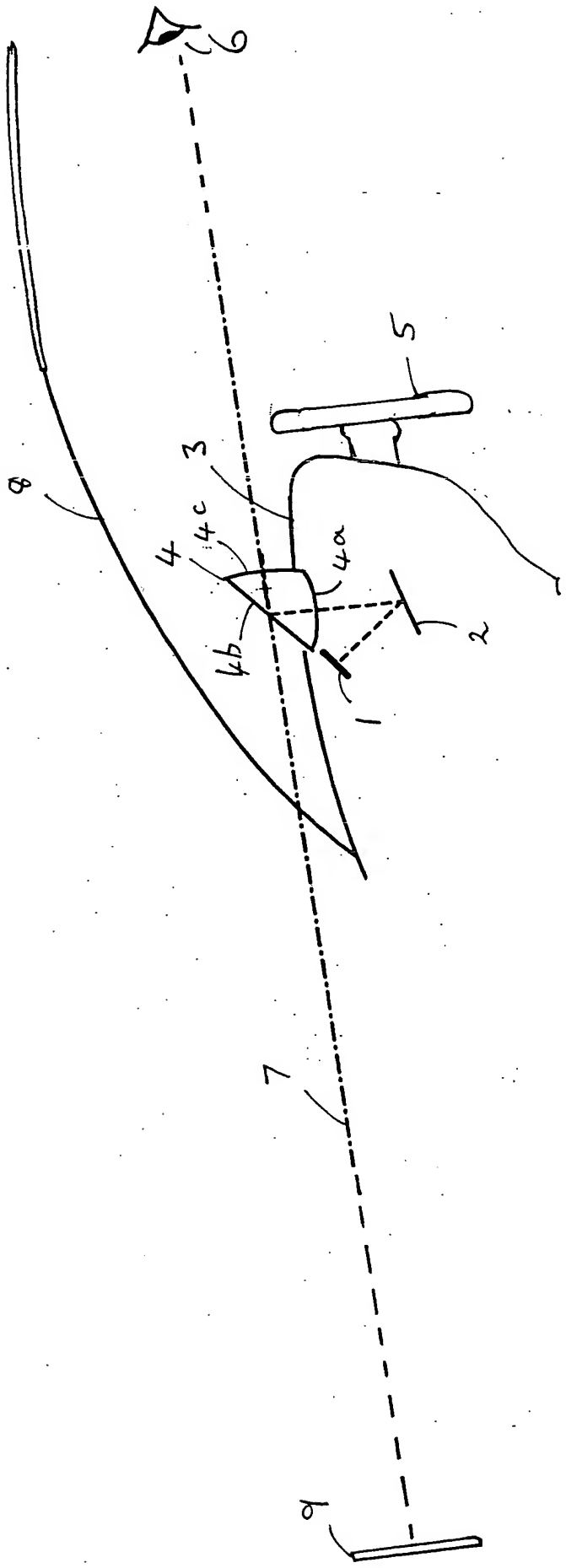
10. A display unit according to any preceding claim in which the optical prism is adapted to be adjustable in order to provide an optimum viewing angle for the driver of the vehicle.

11. A display unit for a vehicle as hereinbefore described with reference to the accompanying drawing.

ABSTRACT (Fig.)

Display Unit for a Vehicle

A display unit for presenting visual information to the driver of a vehicle comprises a dashboard-mounted liquid crystal display 1, mirror 2 and prism 3 for presenting the driver with a magnified virtual image for viewing through a prism face 4c at a comfortable distance of approximately 2 metres.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